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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/896,783	06/29/2001	Clyde George Bethea	25-66-105-20-29-1-3-35-14	8896

7590 10/22/2004

Lucent Technologies Inc.
Docket Administrator (Room 3J-219)
101 Crawfords Corner Road
Holmdel, NJ 07733

EXAMINER

LI, SHI K

ART UNIT	PAPER NUMBER
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2633

DATE MAILED: 10/22/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/896,783

Applicant(s)

BETHEA ET AL.

Examiner

Shi K. Li

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 19 July 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-22 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-22 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 17 July 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-2, 4-10 and 13-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Christopher (U.S. Patent Application Pub. 2002/0181059) in view of Paiella et al. (R. Paiella et al., "High-Speed Operation of Gain-Switched Mid-infrared Quantum Cascade Lasers", Applied Physics Letters, Vol. 75, No. 17, 25 October 1999) and Sell (U.S. Patent 4,009,385).

Regarding claims 1 and 13, Christopher discloses in FIG. 23 a free space communication system using 10-micron optical links. Christopher teaches in paragraph [0058] that mid-infrared wavelength is preferable over near-infrared because it has less attenuation over fog conditions. The difference between Christopher and the claimed invention is that Christopher does not teach the modulation process. Paiella et al. teaches in FIG. 1 a modulation circuit for directly modulating a quantum cascade (QC) laser operating in mid-infrared wavelength. One of ordinary skill in the art would have been motivated to combine the teaching of Paiella et al. with the free space communication system of Christopher because it is compact and power efficient in comparison with traditional mid-infrared source, such as CO₂ laser. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to use a direct modulation of a QC laser, as taught by Paiella et al., as the light source in the free space

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communication system of Christopher because QC laser is compact and power efficient in comparison with traditional mid-infrared source, such as CO₂ laser.

The modified free space communication system of Christopher and Paiella et al. still fails to teach receiving of a stream of input data signals since Paiella et al. only uses FIG. 1 to demonstrate the operation theory. Sell teaches in FIG. direct modulation of a laser with a stream of input digital signals through terminal 103. One of ordinary skill in the art would have been motivated to combine the teaching of Salter et al. with the modified free space communication system of Christopher and Paiella et al. because the circuit of Sell maintains DC bias for the laser to keep the operation near and below lasing threshold and operates with real application data signals. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the laser driving circuit of Salter et al. in the modified free space communication system of Christopher and Paiella et al. because the circuit of Sell maintains DC bias for the laser to keep the operation near lasing threshold and operates with real application data signals.

Regarding claims 2, 4-6 and 14-15, Sell teaches in FIG and col. 3, lines 23-col. 4, line 28 to operate a laser such that a low optical power level is below lasing threshold and a high optical power level is above lasing threshold. Since the bias is below threshold, the lasing interval is shorter than the nonlasing interval.

Regarding claims 7-9 and 17-18, Christopher suggests a wavelength of 10 microns.

Regarding claims 10 and 19, Paiella et al. teaches mid-infrared QC lasers operates in the second atmospheric window. An atmospheric window is a wavelength range at which

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atmosphere has relatively low attenuation (e.g., see Patel, U.S. Patent 3,723,902, col. 9, lines 5-10).

Regarding claim 16, Paiella et al. teaches a quantum cascade laser.

3. Claims 3 and 21-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Christopher, Paiella et al. and Sell as applied to claims 1-2, 4-10 and 13-19 above, and further in view of Hwang et al. (U.S. Patent 6,549,556 B1).

Christopher, Paiella et al. and Sell have been discussed above in regard to claims 1-2, 4-10 and 13-19. The difference between Christopher, Paiella et al. and Sell and the claimed invention is that Christopher, Paiella et al. and Sell do not teach electrical pumping and optical pumping for laser operation. Hwang et al. teaches in col. 1, lines 50-65 operation of semiconductor lasers. A semiconductor laser includes a gain region for building up energy. Various forms of pumping energy may be utilized to cause the active region to emit photons including electrical pumping, optical pumping and electron beam pumping. These are equivalent mechanisms for pumping energy to a semiconductor laser. Where the claimed differences involve the substitution of interchangeable or replaceable equivalents and the reason for the selection of one equivalent for another was not to solve an existent problem, such substitution has been judicially determined to have been obvious. See *In re Ruff*, 118, USPQ 343 (CCPA 1958). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use either electrical pumping or optical pumping to build up energy in the active region of a semiconductor laser in the modified free space communication system of Christopher, Paiella et al. and Sell.

4. Claims 11-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Christopher, Paiella et al. and Sell as applied to claims 1-2, 4-10 and 13-19 above, and further in view of Paiella[2000] (R. Paiella et al., "Generation and Detection of High-Speed Pulses of Mid-Infrared Radiation with Intersubband Semiconductor Lasers and Detectors", IEEE Transactions on Photonics Technology Letters, Vol. 12, No. 7, July 2000).

Christopher, Paiella et al. and Sell have been discussed above in regard to claims 1-2, 4-10 and 13-19. The difference between Christopher, Paiella et al. and Sell and the claimed invention is that the modified free space communication of Christopher, Paiella et al. and Sell does not teach a QC laser with a rate as high as 2 GHz. Paiella[2000] teaches a QC laser which operates at around 3 GHz (see p. 781, right col., first paragraph). One of ordinary skill in the art would have been motivated to combine the teaching of Paiella[2000] with the modified free space communication of Christopher, Paiella et al. and Sell because the laser of Paiella[2000] supports faster data communication. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the QC laser of Paiella[2000] in the modified free space communication of Christopher, Paiella et al. and Sell because the laser of Paiella[2000] supports faster data communication.

5. Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Christopher, Paiella et al. and Sell as applied to claims 1-2, 4-10 and 13-19 above, and further in view of Durant et al. (U.S. Patent 6,016,212).

Christopher, Paiella et al. and Sell have been discussed above in regard to claims 1-2, 4-10 and 13-19. The difference between Christopher, Paiella et al. and Sell and the claimed invention is that the modified free space communication of Christopher, Paiella et al. and Sell

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does not teach collimating optics. However, it is well known in the art to use optics to change the geometry of light beams. For example, Durant et al. teaches in FIG. 1 and col. 3, lines 5-10 to use collimating optics to form a light beam of a diameter of half an inch (13 mm). One of ordinary skill in the art would have been motivated to combine the teaching of Durant et al. with the modified free space optical communication system of Christopher, Paiella et al. and Sell because an appropriate light beam size makes it easy for alignment while maintains a reasonable size for the optics such as telescope. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to use collimating optics to obtain an appropriate geometry for the light beam, as taught by Durant et al., in the modified free space optical communication system of Christopher, Paiella et al. and Sell because an appropriate light beam size makes it easy for alignment while maintains a reasonable size for the optics such as telescope.

Response to Arguments

6. Applicant's arguments with respect to claims 1-22 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

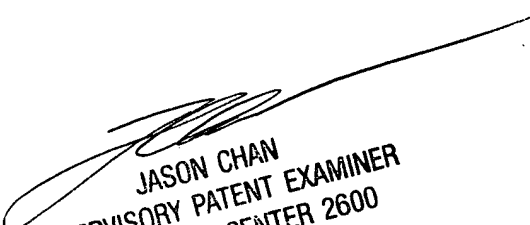
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shi K. Li whose telephone number is 571 272-3031. The examiner can normally be reached on Monday-Friday (8:30 a.m. - 5:00 p.m.).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jason Chan can be reached on 571 272-3022. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

skl



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